

We claim:

1. A microprocessor based smart resolution valve pressure control system for performing a wheel slip control valve response test, said microprocessor based smart resolution valve pressure control system comprising:

a) a sensing means for ensuring that brakes disposed on a truck of a vehicle are at full service and that a truck brake cylinder pressure (BCP) is greater than a first predetermined BCP;

b) a first testing means connected to a wheel slip control valve for operating said wheel slip control valve in response to sensing that said brakes disposed on said truck are at full service and that said first truck BCP is greater than said first predetermined BCP and for pulse releasing said wheel slip control valve to determine an elapsed time that said truck BCP drops from a second predetermined BCP to a third predetermined BCP;

c) a release time adjustment means connected to said first testing means for one of adding and subtracting to and from, respectively, a release time and hold time depending on said elapsed time;

d) a release time decision means for detecting if said release time adjustment means has changed said

release time, and a reapply brake cylinder pressure means connected to said release time decision means for enabling again said first testing means if said release time has changed;

5 e) an exhaust brake cylinder pressure means connected to said release time decision means for sending a pulsed release signal and a pulsed hold signal to said control valve and determining if an exhaust BCP is less than a predetermined amount after said
10 pulsed release signal and pulsed hold signal;

f) a second testing means connected to a continue decision means for applying an apply pulse to said control valve for a predetermined time and timing a BCP rise between a fourth predetermined BCP and a
15 fifth predetermined BCP;

g) an apply time adjustment means connected to said second testing means for one of adding and subtracting to and from, respectively, an apply time and hold time depending on said time of said
20 BCP rise between said fourth predetermined BCP and said fifth predetermined BCP; and

h) an apply time decision means connected to said apply time adjustment means for sending one of an enabling signal to a release brake cylinder

pressure means if said apply time has changed and
an end wheel slip control valve test signal, said
release brake cylinder pressure means, when
enabled, for enabling again said second testing
means.

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2. A microprocessor based smart resolution valve pressure
control system, according to claim 1, wherein said
microprocessor based smart resolution valve pressure control
10 system further includes:

a) a begin decision means connected intermediate said
sensing means and said first testing means for
communicating a signal generated in said sensing
means; and

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b) a first message communication means connected to
said begin decision means for ending said wheel
slip control valve response test and sending a
wheel slip response not run message when one of
said brakes disposed on said truck are not at full
20 service and said first truck BCP is less than said
first predetermined BCP.

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3. A microprocessor based smart resolution valve pressure
control system, according to claim 1, wherein said

microprocessor based smart resolution valve pressure control system further includes:

a) said continue decision means connected intermediate said exhaust brake cylinder pressure means and said second testing means for communicating a signal generated in said exhaust brake cylinder means; and

b) a second message communicator means connected to said continue decision means for ending said wheel slip control valve response test and sending a wheel slip response not run message if said exhaust BCP is greater than said predetermined amount.

4. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said first predetermined pressure is about 60 psi or greater.

5. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said predetermined amount is less than about 1 psi.

6. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said second predetermined BCP and said third predetermined BCP are about 55 psi and about 5 psi, respectively.

7. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said fourth predetermined BCP and said fifth predetermined BCP is about 5 psi and about 50 psi, respectively:

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8. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said release time adjustment means adds to said release time if said elapsed time is greater than 750 milliseconds (ms), and subtracts from said
10 release time if said elapsed time is less than 720 ms.

9. A microprocessor based smart resolution valve pressure control system, according to claim 1, wherein said apply time adjustment means adds to said apply time if said time of said
15 BCP rise is greater than 1080 ms, and subtracts from said apply time if said time of said BCP rise is less than 1050 ms.

10. An apparatus used to control a wheel slip control magnet valve, said apparatus comprising:

- 20 a) a logic control means for providing one of a release time and an application time together with a hold time;
- b) a change decision means connected to said logic control means for determining if said one of a

release time and an application time, and said hold time have changed since a last cycle of said apparatus used to control a wheel slip control magnet valve;

- 5 c) a valve timing set up means connected to said change decision means for setting said one of a release time and an application time, and said hold time if said one of a release time and an application time have changed;
- 10 d) a pulse timing means connected to said change decision means and said valve timing set up means for determining if a remaining pulse time is equal to 0, and enabling a hold timing means if said remaining pulse time is equal to 0, and enabling a
- 15 pulse timer decrement means if said remaining pulse time is greater than 0;
- e) a hold timing means connected to said pulse timing means for determining if a remaining hold time is equal to 0, and enabling a timer's reset means if
- 20 said remaining hold time is equal to 0, and enabling a hold timer decrement means if said remaining hold time is greater than 0, said pulse timer decrement means and said hold timer decrement means for decrementing one of said remaining pulse

time and said remaining hold time, respectively,
and for enabling a valve control means, said
timer's reset means for resetting said pulse timing
means and said hold timing means;

5 f) a valve control means connected to said pulse timer
decrement means and said hold timer decrement means
for enabling a magnet valve based on one of said
pulse time and said hold time; and

10 g) an end interrupt routine means connected to said
valve control means for one of ending a current
repetition of controlling said wheel slip control
magnet valve after one of said enabling said magnet
valve, and resetting said pulse timing means and
said hold timing means.

15 11. An apparatus used to control a wheel slip control
magnet valve, according to claim 10, said apparatus further
including a closed loop feedback means disposed between said
timer's reset means and said end interrupt routine means to
20 recalibrate a current pulse time and a current hold time, if
necessary.

12. An apparatus used to control a wheel slip control
magnet valve, according to claim 10, wherein said one of a

release time and an application time and said hold time correspond to one of a plurality of pressure rate response values.

5 13. An apparatus used to control a wheel slip control magnet valve, according to claim 10, wherein said pulse state, pulse time and hold time are stored in a microprocessor.

10 14. A method for calibrating a smart resolution valve pressure control having a plurality of release times and a corresponding plurality of hold times said method comprising the additional steps of:

15 a) applying a release pulse of one of a first predetermined duration of a selected one of said plurality of release times and applying a hold pulse of a second predetermined duration corresponding to said selected one of said plurality of release times to a valve controlling pressure to a brake cylinder initially having a minimum first predetermined pressure;

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 b) measuring an elapsed time that said brake cylinder changes from a second predetermined pressure to a third predetermined pressure;

- c) increasing said first predetermined duration and decreasing said second predetermined duration if said elapsed time is greater than a first predetermined time, and decreasing said first predetermined duration and increasing said second predetermined duration if said elapsed time is less than a second predetermined time; and
- d) repeating steps (a) through (c) if said first predetermined duration changes in step (c).

15. A method for calibrating a smart resolution valve pressure control, according to claim 14, wherein said method further includes:

- a) receiving a signal to apply said selected one of said plurality of release times and said corresponding hold time;
- b) determining if said selected one of said plurality of release times corresponds to a last preceding repetition of said smart resolution valve pressure control, and if so, continuing to apply said selected one of said release time and hold times.

16. The method for calibrating a smart resolution pressure control, according to claim 15, wherein step (b) includes the

step of resetting a stored release time and hold time in said smart resolution pressure control to a current release time if said current release time is different than that of said last preceding repetition and applying said current release time.

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17. A method for calibrating a smart resolution valve pressure control having a plurality of application times and a corresponding plurality of hold times said method comprising the steps of:

- 10 a) applying an application pulse of a first predetermined duration of a selected one of said plurality of application times and applying a hold pulse of a second predetermined duration corresponding to said selected one of said
- 15 plurality of application times to a valve controlling pressure to a brake cylinder initially having a maximum first predetermined pressure;
- b) measuring an elapsed time that said brake cylinder changes from a second predetermined pressure to a
- 20 third predetermined pressure;
- c) increasing said first predetermined duration and decreasing said second predetermined duration if said elapsed time is greater than a first predetermined time, and decreasing said first

predetermined duration and increasing said second predetermined duration if said elapsed time is less than a second predetermined time; and

d) repeating steps (a) through (c) if said first predetermined duration changes in step (c).

18. A method for calibrating a smart resolution valve pressure control, according to claim 17, wherein said method further includes:

a) receiving a signal to apply said selected one of said plurality of application times and said corresponding hold time; and

b) determining if said selected one of said plurality of application times corresponds to a last preceding repetition of said smart resolution valve pressure control, and if so, continuing to apply said selected one of said release times and hold times.

19. The method for calibrating a smart resolution pressure control, according to claim 18, wherein step (b) includes the step of resetting a stored application time and hold time in said smart resolution pressure control to a current application time if said current application time is different than that of

said last preceding repetition, and applying said current application time.